Ecological Studies

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M. Kappelle (Ed.)

Ecology and Conservation of Neotropical Montane Oak Forests

With 62 Figures and 64 Tables

Springer
Cover illustration: Landscape mosaic of the oak forest zone along the Savegre River at about 2,300 m elevation near San Gerardo de Dota, Costa Rica. This landscape is made up of old-growth montane oak forest along the mountain crests, recovering forests at the lower forest edges, pastures with isolated oak and Buddleja trees, living fences of cypress trees, and orchards with young apple trees. The photo was taken by Maarten Kappelle in 1992.
The editor dedicates this book to his sons Derk Frederik and Bernard Floris, and to all other children living in and near the highland oak forests of the American Tropics. Today, these magnificent forests suffer severely from climate change, land use change, and ultimately, biodiversity loss. If we want our children – and their children and grandchildren – to enjoy the numerous, economically valuable environmental goods and services that these forests provide us, we need to pay for their conservation and sustainable use. Only then will we be able to ensure that human society continues to obtain the benefits of Earth’s natural capital as expressed in unique ecosystems such as the Neotropical montane oak forests. Only then will we assure the conditions for a decent, healthy, and secure life for our children and those to come.
Today, mid- and high-elevation belts in the American Tropics still support montane evergreen broad-leaved oak (*Quercus*) forests. They range from relatively dry woodlands to extremely wet cloud forests, and may occur either as pure monotypic stands – sometimes with giant oaks up to 60 m tall – or as mixed-species systems in which oak co-occurs with other predominant genera such as pine (*Pinus*) and sweetgum (*Liquidambar*). They are found throughout southern Mexico, Central America and the Colombian Andes, and form a major component of the American Tropics ecoregions, biodiversity hotspots, and centers of plant diversity.

Their biological richness, expressed in the large variety of trees, shrubs, epiphytic orchids and bromeliads, ferns, bryophytes, lichens and fungi, is indeed striking. Even animal life is astonishing: the avifauna is among the greatest worldwide, with the mythical Resplendent Quetzal as its most beautiful representative. Large mammals such as jaguar, puma, tapir, peccary and deer still roam around in considerable quantities. In terms of biogeochemical cycling, most of these forests, and especially the oak cloud forests filter large air masses. They capture and incorporate water and nutrients from mist and fog into their cycles, providing nascent rivers with clear fresh water.

Originally, these montane oak forests were widely distributed. However, since the early 1800s, large oak forest areas in the highland Neotropics have made way for coffee plantations and pastures. Today, only few intact blocks remain while most forests are fragmented, suffering from severe disturbance. Remnant patches of forest and woodland are under increasing threat as they are cut for timber, charcoal and fuelwood, or converted into grasslands for cattle.

The importance of this kind of forest for humanity has recently been recognized by various scholars. Experts have noted their key role in providing society with drinking and irrigation water, supplying large urban and rural populations in and near mayor cities in Mesoamerica and the Colombian Andes (e.g., Guatemala City, San José and Bogotá). However, the destructive anthropogenic forces that cause oak forest fragmentation and degradation
ultimately lead to species extinction, and loss of environmental goods and services on which human society so strongly depends.

Over the last 20 years, neotropical montane oak forests have been studied intensively by numerous scientists. In recent years, a considerable amount of scientific knowledge on this forest system has become available. To date, however, this knowledge has mainly appeared in a scattered fashion, often only in gray literature. So far, no publication has addressed this ecosystem in a coherent and integrated manner, oriented to a wider audience. Certainly, such a comprehensive volume, providing a thorough understanding of forest patterns and processes in a synthetic and holistic manner, is particularly important for sustainable forest management and lasting biodiversity conservation.

In view of this growing demand, the editor has assembled, in close cooperation with 67 authors from ten countries, the existing body of knowledge on these magnificent oak forests into one comprehensive scientific volume. It is the first state-of-the-art regional account that treats such diverse aspects as the paleo-ecology, biogeography, structure, composition, biodiversity, population dynamics, ecosystem dynamics, fragmentation and recovery, and conservation and sustainable use of natural and managed oak-dominated forests in the highlands of the American Tropics.

It is expected that this volume will be useful to tropical and temperate biologists alike, to biogeographers, plant ecologists, conservation biologists, foresters, policy makers, site practitioners, researchers, lecturers, tutors, and all others with an interest in tropical oak forest ecology and conservation. The editor is confident that this work will help advance scientific knowledge, vitally needed for conserving, restoring and sustainably using the rich oak forests still present in the highland tropics of the New World.

At Springer Verlag in Heidelberg, I would like to gratefully acknowledge Andrea Schlitzberger for initial encouragement to prepare the book and for guiding it to completion. Dieter Czeschlik supported the project throughout its development. Monique Delafontaine and Friedmut Kröner did an excellent job copy-editing and production-editing the chapters, respectively. Ernst-Detlef Schulze, Series Editor in Jena, suggested many improvements to the original manuscript. Finally, I can never thank enough my beloved wife – and co-author of one of the chapters – Marta E. Juárez, for her moral support and encouragement during the gestation of this book.

Maarten Kappelle

San José, Costa Rica

October 2005
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